



**GARMIN AT TEST REPORT**  
**FOR THE**  
**UNIVERSAL ACCESS TRANSCEIVER, GDL 90**  
**FCC PART 87**  
**COMPLIANCE**

**DATE OF ISSUE: MAY 27, 2004**

**PREPARED FOR:**

Garmin AT  
2345 Turner Rd. S.E.  
Salem, OR 97302

P.O. No.: 223235  
W.O. No.: 81985

**PREPARED BY:**

Mary Ellen Clayton  
CKC Laboratories, Inc.  
5473A Clouds Rest  
Mariposa, CA 95338

Date of test: April 14 - May 25, 2004

**Report No.: FC04-044**

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## ADMINISTRATIVE INFORMATION

|                                |                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>DATE OF TEST:</b>           | April 14 - May 25, 2004                                                                                                  |
| <b>DATE OF RECEIPT:</b>        | April 14, 2004                                                                                                           |
| <b>PURPOSE OF TEST:</b>        | To demonstrate the compliance of the Universal Access Transceiver, GDL 90 with the requirements for FCC Part 87 devices. |
| <b>TEST METHOD:</b>            | FCC Part 87                                                                                                              |
| <b>FREQUENCY RANGE TESTED:</b> | 9 kHz-10 GHz                                                                                                             |
| <b>MANUFACTURER:</b>           | Garmin AT<br>2345 Turner Rd. S.E.<br>Salem, OR 97302                                                                     |
| <b>REPRESENTATIVE:</b>         | George Cooley                                                                                                            |
| <b>TEST LOCATION:</b>          | CKC Laboratories, Inc.<br>5473A Clouds Rest<br>Mariposa, CA 95338                                                        |

## SUMMARY OF RESULTS

As received, the Garmin AT Universal Access Transceiver, GDL 90 was found to be fully compliant with the following standards and specifications:

### United States

➤ FCC Part 87

## CONDITIONS FOR COMPLIANCE

No modifications to the EUT were necessary to comply.

## APPROVALS

Steve Behm, Director of Engineering Services

### QUALITY ASSURANCE:

A handwritten signature in black ink, appearing to read "Joyce Walker".

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Joyce Walker, Quality Assurance Administrative Manager

### TEST PERSONNEL:

A handwritten signature in black ink, appearing to read "Randy Clark".

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Randy Clark, EMC Engineer

A handwritten signature in black ink, appearing to read "Mike Wilkinson".

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Mike Wilkinson, Lab Manager

## **EQUIPMENT UNDER TEST (EUT) DESCRIPTION**

The EUT tested by CKC Laboratories was a production unit

## **EQUIPMENT UNDER TEST**

### **Universal Access Transceiver**

Manuf: Garmin AT  
Model: GDL 90  
Serial: 6068135  
FCC ID: EOJGDL90A1H (pending)

## **PERIPHERAL DEVICES**

The EUT was tested with the following peripheral device(s):

### **DC Power Supply**

Manuf: Astron  
Model: LS-10A  
Serial: 99050014

### **I/O Test Interface Unit**

Manuf: UPS Aviation Technologies  
Model: RL#E-81-4  
Serial: J

#### **TEMPERATURE AND HUMIDITY DURING TESTING**

The temperature during testing was within +15°C and + 35°C.

The relative humidity was between 20% and 75%.

#### **FCC 2.1033(c)(3) USER'S MANUAL**

The necessary information is contained in a separate document.

#### **FCC 2.1033 (c)(4) TYPE OF EMISSIONS**

The UAT emissions type is F1D (FM modulated, one digital channel).

The emissions type can be derived using the following formula:

$B_n = 2(B + 1)F_m$ , with  $B = 0.6$  (the modulation index) and  $F_m = 520$  kHz.

$B_n = 1.66$  MHz,

This gives a full emissions designator of 1M70F1D

#### **FCC 2.1033 (c)(5) FREQUENCY RANGE**

978 MHz.

#### **FCC 2.1033 (c)(6) OPERATING POWER**

50.1 Watts.

#### **FCC 2.1033 (c)(7) MAXIMUM POWER RATING**

55 Watts.

#### **FCC 2.1033 (c)(8) DC VOLTAGES**

The necessary information is contained in a separate document.

#### **FCC 2.1033 (c)(9) TUNE-UP PROCEDURE**

The necessary information is contained in a separate document.

#### **FCC 2.1033(c)(10) SCHEMATICS AND CIRCUITRY DESCRIPTION**

The necessary information is contained in a separate document.

#### **FCC 2.1033(c)(11) LABEL AND PLACEMENT**

The necessary information is contained in a separate document.

#### **FCC 2.1033(c)(12) SUBMITTAL PHOTOS**

The necessary information is contained in a separate document.

### **FCC 2.1033 (c)(13) MODULATION INFORMATION**

The transmitter modulation is generated with a Direct Digital Synthesizer (U10). The DDS has an 8-bit parallel interface. The value that is written into the DDS accumulator register is converted to an output frequency at baseband. Varying the data that is sent to the accumulator register modulates the 44.25 MHz baseband frequency. The baseband frequency is up converted to 978 MHz by mixing it with a 933.75 MHz, +7 dBm transmitter local oscillator (LO) into U30 the transmit mixer. The signal then passes through FLT1, a passive ceramic bandpass filter to attenuate undesired harmonics and mixing artifacts before being sent to the power amplifiers for final amplification to 50 watts.

### **FCC 2.1033(c)(14)/2.1046 - RF POWER OUTPUT**

#### ***Test Equipment:***

| Function                           | S/N        | Calibration Date | Cal Due Date | Asset # |
|------------------------------------|------------|------------------|--------------|---------|
| HP-8596E                           | 3346A00225 | 06/24/2002       | 06/24/2004   | 00783   |
| 30 dB attenuator, Bird 25-A-MFN-30 | 9724       | 05/08/2003       | 05/08/2005   | P01577  |
| Attenuator 30dB, Bird 25-A-MFN-30  | 9949       | 05/09/2003       | 05/09/2005   | P01572  |
| Cable, WL Gore 2'                  | 149047     | 04/10/2003       | 04/10/2005   | P01527  |

#### ***Equipment Under Test (\* = EUT):***

| Function                      | Manufacturer | Model # | S/N     |
|-------------------------------|--------------|---------|---------|
| Universal Access Transceiver* | Garmin AT    | GDL 90  | 6068135 |

#### ***Support Devices:***

| Function                | Manufacturer              | Model #   | S/N      |
|-------------------------|---------------------------|-----------|----------|
| DC Power Supply         | Astron                    | LS-10A    | 99050014 |
| I/O Test Interface Unit | UPS Aviation Technologies | RL#E-81-4 | J        |

#### ***Test Conditions / Notes:***

EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, both ports are tested. EUT RF output port is connected directly to a spectrum analyzer through suitable attenuation. RBW = VBW = 3 MHz.

#### ***Measurement Data:***

| Frequency (MHz) | RF Port | Peak Power Output (dBm) | Peak Power Output (Watts) |
|-----------------|---------|-------------------------|---------------------------|
| 978             | Upper   | 47.0                    | 50.1                      |
| 978             | Lower   | 45.8                    | 38.0                      |

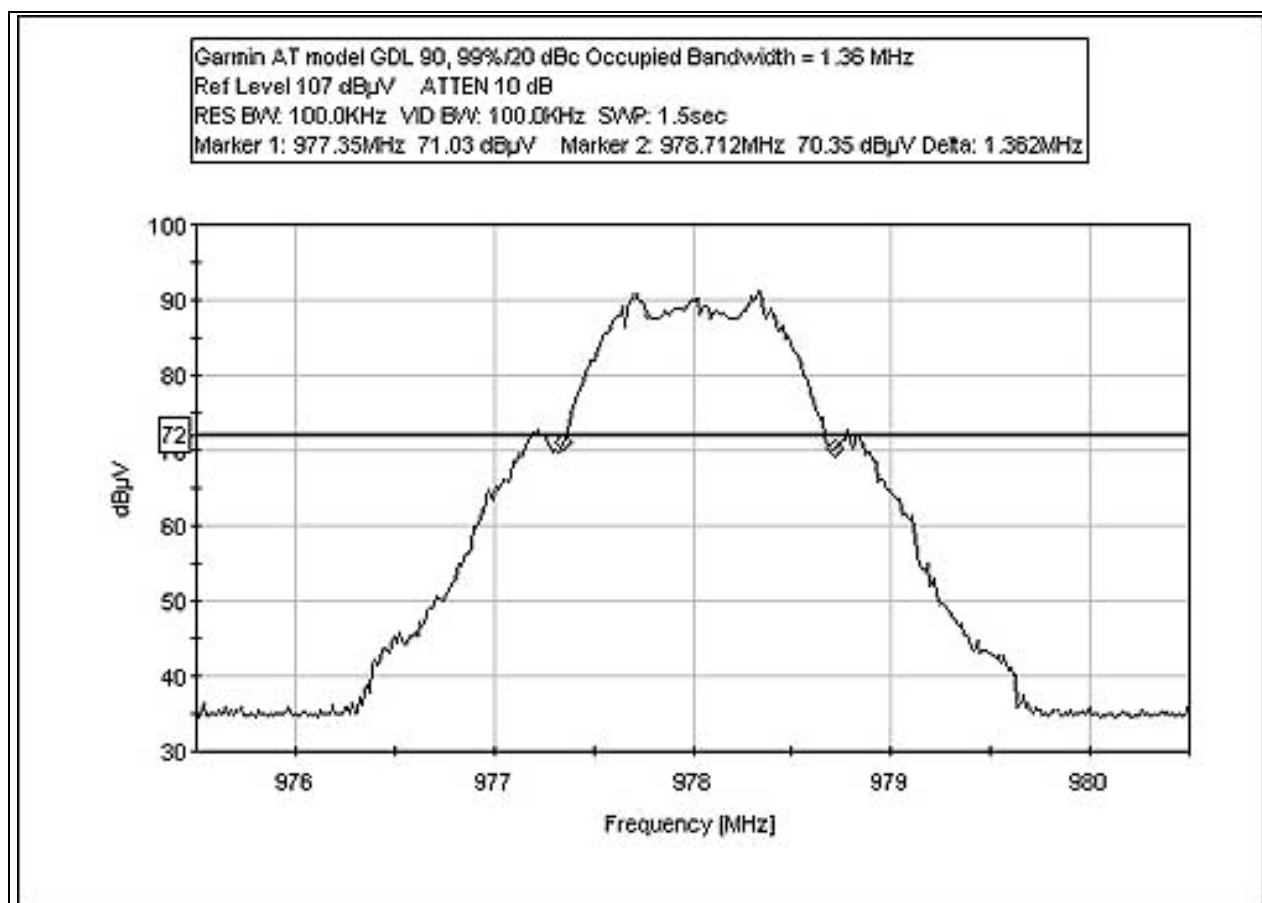
**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



## FCC 2.1033(c)(14)/2.1049(i)/87.137 - OCCUPIED BANDWIDTH

### *Test Conditions / Notes:*

EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, both ports are tested. EUT RF output port is connected directly to a spectrum analyzer through suitable attenuation. RBW = VBW = 3 MHz.



### *Test Equipment:*

| Function                           | S/N        | Calibration Date | Cal Due Date | Asset # |
|------------------------------------|------------|------------------|--------------|---------|
| HP-8596E                           | 3346A00225 | 06/24/2002       | 06/24/2004   | 00783   |
| 30 dB attenuator, Bird 25-A-MFN-30 | 9724       | 05/08/2003       | 05/08/2005   | P01577  |
| Attenuator 30dB, Bird 25-A-MFN-30  | 9949       | 05/09/2003       | 05/09/2005   | P01572  |
| Cable, WL Gore 2'                  | 149047     | 04/10/2003       | 04/10/2005   | P01527  |

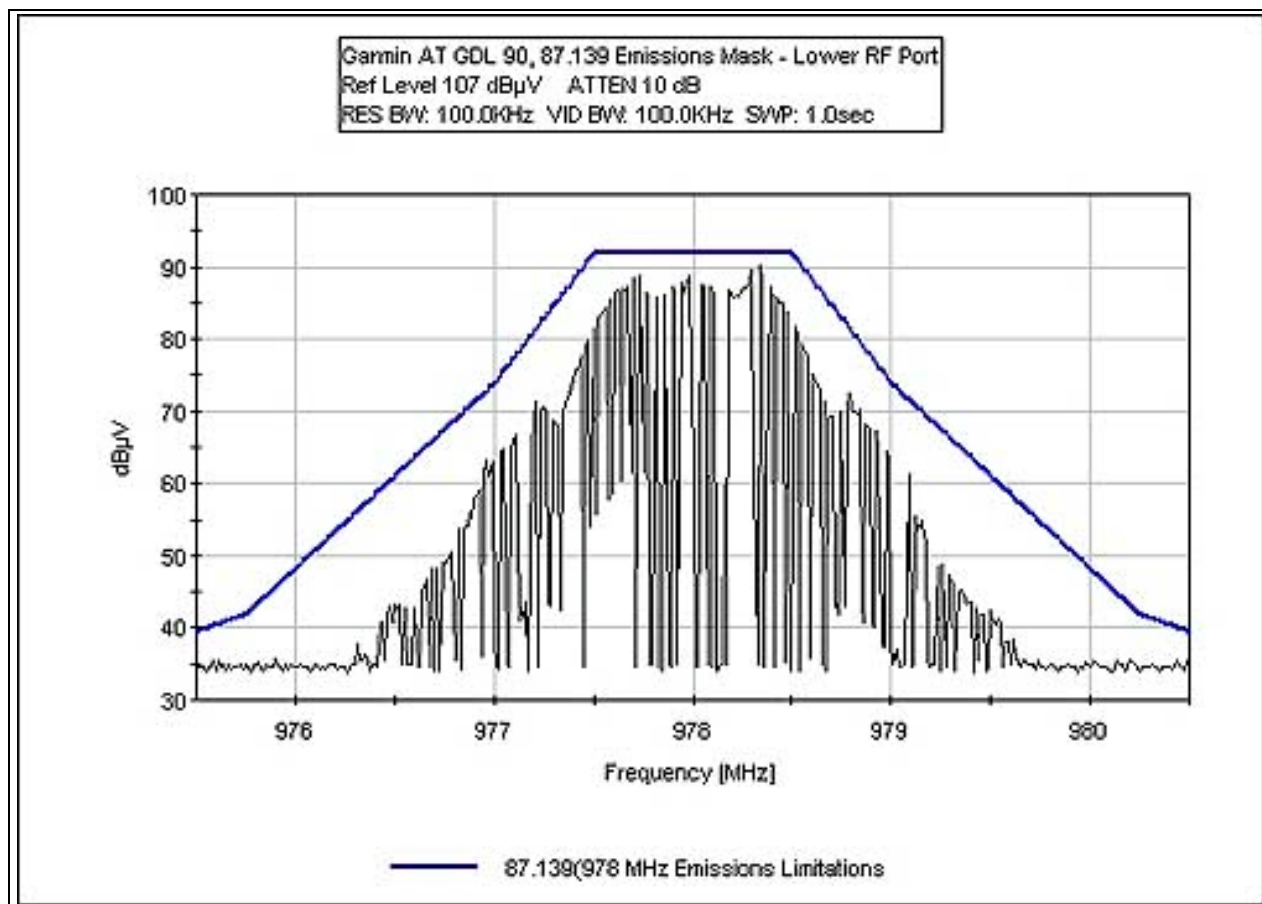
**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



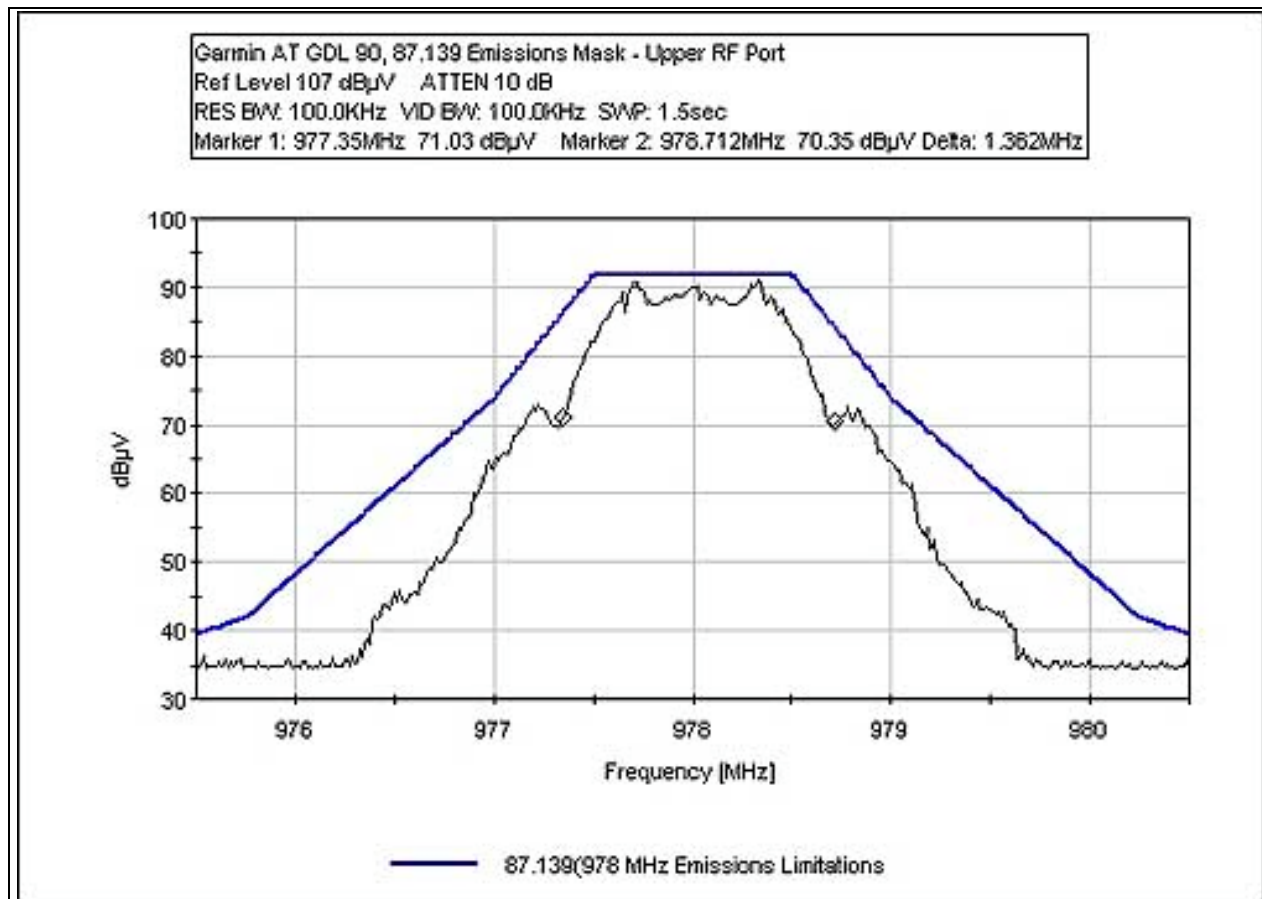
## FCC PART 87.139 EMISSIONS MASK LOWER RF PORT

### *Test Conditions / Notes:*

EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, both ports are tested. EUT RF output port is connected directly to a spectrum analyzer through suitable attenuation. RBW = VBW = 3 MHz.



## FCC PART 87.139 EMISSIONS MASK UPPER RF PORT



### Test Equipment:

| Function                           | S/N        | Calibration Date | Cal Due Date | Asset # |
|------------------------------------|------------|------------------|--------------|---------|
| HP-8596E                           | 3346A00225 | 06/24/2002       | 06/24/2004   | 00783   |
| 30 dB attenuator, Bird 25-A-MFN-30 | 9724       | 05/08/2003       | 05/08/2005   | P01577  |
| Attenuator 30dB, Bird 25-A-MFN-30  | 9949       | 05/09/2003       | 05/09/2005   | P01572  |
| Cable, WL Gore 2'                  | 149047     | 04/10/2003       | 04/10/2005   | P01527  |

**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



## **FCC 2.1033(c)(14)/2.1051/87.139 - SPURIOUS EMISSIONS AT ANTENNA TERMINAL**

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Garmin AT**  
 Specification: **2.1051 / 87.139**  
 Work Order #: **81985**  
 Test Type: **Conducted RF Power**  
 Equipment: **Universal Access Transceiver**  
 Manufacturer: **Garmin AT**  
 Model: **GDL 90**  
 S/N: **6068135**

Date: 05/03/2004  
 Time: 10:38:38 AM  
 Sequence#: 6  
 Tested By: Randal Clark

### ***Test Equipment:***

| Function                          | S/N        | Calibration Date | Cal Due Date | Asset # |
|-----------------------------------|------------|------------------|--------------|---------|
| HP 8566B SA                       | 2209A01404 | 02/26/2003       | 02/26/2005   | 00490   |
| HP 8566B SA Display               | 2403A08241 | 02/26/2003       | 02/26/2005   | 00489   |
| HP 85650A QPA                     | 2811A01267 | 02/26/2003       | 02/26/2005   | 00478   |
| Attenuator 30dB, Bird 25-A-MFN-30 | 9949       | 05/09/2003       | 05/09/2005   | P01572  |
| Attenuator 14dB, JFW 50FHC-014-20 |            | 05/08/2003       | 05/08/2005   | P01630  |
| Cable, WL Gore 2'                 | 149047     | 04/10/2003       | 04/10/2005   | P01527  |

### ***Equipment Under Test (\* = EUT):***

| Function                      | Manufacturer | Model # | S/N     |
|-------------------------------|--------------|---------|---------|
| Universal Access Transceiver* | Garmin AT    | GDL 90  | 6068135 |

### ***Support Devices:***

| Function                | Manufacturer              | Model #   | S/N      |
|-------------------------|---------------------------|-----------|----------|
| DC Power Supply         | Astron                    | LS-10A    | 99050014 |
| I/O Test Interface Unit | UPS Aviation Technologies | RL#E-81-4 | J        |

### ***Test Conditions / Notes:***

EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, only one port is tested. Test data represents the worst case emissions. Due to EUT transmit duty cycle, RF output port conducted emissions are performed using max hold function. Each sweep range is allowed to maximize for a minimum duration of 3 minutes. Frequency Range Investigated 9 kHz to 30 MHz. Measurement Detector Functions: 9kHz to 150kHz RBW=VBW=300Hz, 150kHz to 30MHz RBW=VBW=10kHz.  
**No emissions detected within 20dB of the limit.**

### ***Transducer Legend:***

|                       |             |
|-----------------------|-------------|
| T1=Pad 14dB AN P01631 | T2=Pad 30dB |
|-----------------------|-------------|

### ***Measurement Data:***

Reading listed by margin.

Test Distance: None

| # | Freq<br>MHz | Rdng<br>dBμV | T1<br>dB | T2<br>dB | dB | dB | Dist<br>Table | Corr<br>dBμV | Spec<br>dBμV | Margin<br>dB | Polar<br>Ant |
|---|-------------|--------------|----------|----------|----|----|---------------|--------------|--------------|--------------|--------------|
| 1 | 151.092k    | 20.8         | +14.1    | +29.6    |    |    | +0.0          | 64.5         | 94.0         | -29.5        | None         |
| 2 | 199.208k    | 18.7         | +14.1    | +29.6    |    |    | +0.0          | 62.4         | 94.0         | -31.6        | None         |
| 3 | 182.472k    | 17.9         | +14.1    | +29.6    |    |    | +0.0          | 61.6         | 94.0         | -32.4        | None         |

|    |          |      |       |       |      |      |      |       |      |
|----|----------|------|-------|-------|------|------|------|-------|------|
| 4  | 224.312k | 16.5 | +14.1 | +29.7 | +0.0 | 60.3 | 94.0 | -33.7 | None |
| 5  | 241.048k | 16.2 | +14.1 | +29.7 | +0.0 | 60.0 | 94.0 | -34.0 | None |
| 6  | 245.232k | 15.5 | +14.1 | +29.7 | +0.0 | 59.3 | 94.0 | -34.7 | None |
| 7  | 12.130k  | 15.9 | +14.0 | +29.2 | +0.0 | 59.1 | 94.0 | -34.9 | None |
| 8  | 20.913k  | 15.7 | +14.0 | +29.3 | +0.0 | 59.0 | 94.0 | -35.0 | None |
| 9  | 249.416k | 15.1 | +14.1 | +29.7 | +0.0 | 58.9 | 94.0 | -35.1 | None |
| 10 | 372.844k | 13.7 | +14.1 | +29.7 | +0.0 | 57.5 | 94.0 | -36.5 | None |
| 11 | 341.464k | 13.6 | +14.1 | +29.7 | +0.0 | 57.4 | 94.0 | -36.6 | None |
| 12 | 24.537k  | 13.4 | +14.0 | +29.4 | +0.0 | 56.8 | 94.0 | -37.2 | None |
| 13 | 272.428k | 12.9 | +14.1 | +29.7 | +0.0 | 56.7 | 94.0 | -37.3 | None |
| 14 | 21.610k  | 12.8 | +14.0 | +29.3 | +0.0 | 56.1 | 94.0 | -37.9 | None |
| 15 | 324.728k | 12.1 | +14.1 | +29.7 | +0.0 | 55.9 | 94.0 | -38.1 | None |
| 16 | 28.858k  | 11.5 | +14.0 | +29.4 | +0.0 | 54.9 | 94.0 | -39.1 | None |
| 17 | 17.985k  | 11.4 | +14.0 | +29.3 | +0.0 | 54.7 | 94.0 | -39.3 | None |
| 18 | 10.179k  | 11.4 | +14.0 | +29.2 | +0.0 | 54.6 | 94.0 | -39.4 | None |
| 19 | 25.093M  | 10.2 | +14.1 | +29.7 | +0.0 | 54.0 | 94.0 | -40.0 | None |

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Garmin AT**  
 Specification: **2.1051 / 87.139**  
 Work Order #: **81985**  
 Test Type: **Conducted RF Power**  
 Equipment: **Universal Access Transceiver**  
 Manufacturer: **Garmin AT**  
 Model: **GDL 90**  
 S/N: **6068135**

Date: 05/03/2004  
 Time: 13:45:39  
 Sequence#: 5  
 Tested By: Randal Clark

**Test Equipment:**

| Function                          | S/N        | Calibration Date | Cal Due Date | Asset # |
|-----------------------------------|------------|------------------|--------------|---------|
| HP 8566B SA                       | 2209A01404 | 02/26/2003       | 02/26/2005   | 00490   |
| HP 8566B SA Display               | 2403A08241 | 02/26/2003       | 02/26/2005   | 00489   |
| HP 85650A QPA                     | 2811A01267 | 02/26/2003       | 02/26/2005   | 00478   |
| Attenuator 14dB, JFW 50FHC-014-20 |            | 05/08/2003       | 05/08/2005   | P01630  |
| Attenuator 30dB, Bird 25-A-MFN-30 | 9949       | 05/09/2003       | 05/09/2005   | P01572  |
| Cable, WL Gore 2'                 | 149047     | 04/10/2003       | 04/10/2005   | P01527  |

**Equipment Under Test (\* = EUT):**

| Function                      | Manufacturer | Model # | S/N     |
|-------------------------------|--------------|---------|---------|
| Universal Access Transceiver* | Garmin AT    | GDL 90  | 6068135 |

**Support Devices:**

| Function                | Manufacturer              | Model #   | S/N      |
|-------------------------|---------------------------|-----------|----------|
| DC Power Supply         | Astron                    | LS-10A    | 99050014 |
| I/O Test Interface Unit | UPS Aviation Technologies | RL#E-81-4 | J        |

**Test Conditions / Notes:**

EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, only one port is tested. Test data represents the worst case emissions. Due to EUT transmit duty cycle, RF output port conducted emissions are performed using max hold function. Each sweep range is allowed to maximize for a minimum duration of 3 minutes. Frequency Range Investigated 30 MHz to 10 GHz. Measurement Detector Functions: 30-10000 MHz RBW=VBW=100kHz. Due to the signal characteristics and in order to determine a worst case approach to the emissions, average measurements are performed via calculation as shown below. EUT transmits 420uS at a one second period. Averaging over a 100ms period based on  $10 \cdot \log(\text{On time}/100\text{ms})$  yields  $10 \cdot \log(0.420/100)$  or -23.7 dB.

**Transducer Legend:**

|                            |                       |
|----------------------------|-----------------------|
| T1=Upper Cable             | T2=Cable HF P01527    |
| T3=Pad 30dB                | T4=Pad 14dB AN P01631 |
| T5=Corr Average Correction |                       |

**Measurement Data:**

Reading listed by margin.

Test Distance: None

| # | Freq      | Rdng | T1<br>T5 | T2   | T3    | T4    | Dist  | Corr | Spec | Margin | Polar |
|---|-----------|------|----------|------|-------|-------|-------|------|------|--------|-------|
|   | MHz       | dBμV | dB       | dB   | dB    | dB    | Table | dBμV | dBμV | dB     | Ant   |
| 1 | 959.480M  | 43.1 | +1.8     | +0.2 | +29.7 | +14.2 | +0.0  | 89.0 | 94.0 | -5.0   | None  |
| 2 | 3910.725M | 41.5 | +4.0     | +0.5 | +28.7 | +14.1 | +0.0  | 88.8 | 94.0 | -5.2   | None  |

|    |           |       |               |      |       |       |      |       |       |       |      |
|----|-----------|-------|---------------|------|-------|-------|------|-------|-------|-------|------|
| 3  | 3910.720M | 41.5  | +4.0          | +0.5 | +28.7 | +14.1 | +0.0 | 88.8  | 94.0  | -5.2  | None |
| 4  | 996.600M  | 42.5  | +1.8          | +0.2 | +29.7 | +14.2 | +0.0 | 88.4  | 94.0  | -5.6  | None |
| 5  | 1021.810M | 41.2  | +1.8          | +0.2 | +29.7 | +14.2 | +0.0 | 87.1  | 94.0  | -6.9  | None |
| 6  | 959.500M  | 41.1  | +1.8          | +0.2 | +29.7 | +14.2 | +0.0 | 87.0  | 94.0  | -7.0  | None |
| 7  | 2933.070M | 39.9  | +3.4          | +0.4 | +28.9 | +14.1 | +0.0 | 86.7  | 94.0  | -7.3  | None |
| 8  | 2933.070M | 39.9  | +3.4          | +0.4 | +28.9 | +14.1 | +0.0 | 86.7  | 94.0  | -7.3  | None |
| 9  | 2934.920M | 39.7  | +3.4          | +0.4 | +28.9 | +14.1 | +0.0 | 86.5  | 94.0  | -7.5  | None |
| 10 | 145.980M  | 40.3  | +0.6          | +0.2 | +29.4 | +14.2 | +0.0 | 84.7  | 94.0  | -9.3  | None |
| 11 | 3912.475M | 36.8  | +4.0          | +0.5 | +28.7 | +14.1 | +0.0 | 84.1  | 94.0  | -9.9  | None |
| 12 | 907.985M  | 57.9  | +1.7<br>-23.7 | +0.2 | +29.7 | +14.1 | +0.0 | 79.9  | 94.0  | -14.1 | None |
| 13 | 208.970M  | 31.9  | +0.7          | +0.2 | +29.5 | +14.1 | +0.0 | 76.4  | 94.0  | -17.6 | None |
| 14 | 933.600M  | 52.6  | +1.8<br>-23.7 | +0.2 | +29.7 | +14.1 | +0.0 | 74.7  | 94.0  | -19.3 | None |
| 15 | 635.250M  | 28.9  | +1.4          | +0.2 | +29.6 | +14.1 | +0.0 | 74.2  | 94.0  | -19.8 | None |
| 16 | 958.745M  | 25.6  | +1.8          | +0.2 | +29.7 | +14.2 | +0.0 | 71.5  | 94.0  | -22.5 | None |
| 17 | 281.250M  | 25.7  | +0.9          | +0.2 | +29.6 | +14.1 | +0.0 | 70.5  | 94.0  | -23.5 | None |
| 18 | 977.720M  | 108.0 | +1.8<br>-23.7 | +0.2 | +29.7 | +14.2 | +0.0 | 130.2 | 154.0 | -23.8 | None |
| 19 | 768.600M  | 23.6  | +1.6          | +0.2 | +29.6 | +14.1 | +0.0 | 69.1  | 94.0  | -24.9 | None |
| 20 | 1047.520M | 45.9  | +1.9<br>-23.7 | +0.2 | +29.7 | +14.2 | +0.0 | 68.2  | 94.0  | -25.8 | None |
| 21 | 1955.985M | 45.4  | +2.6<br>-23.7 | +0.4 | +29.2 | +14.1 | +0.0 | 68.0  | 94.0  | -26.0 | None |
| 22 | 3913.240M | 42.0  | +4.0<br>-23.7 | +0.5 | +28.7 | +14.1 | +0.0 | 65.6  | 94.0  | -28.4 | None |

**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



## FCC 2.1033(c)(14)/2.1053/87.139 - FIELD STRENGTH OF SPURIOUS RADIATION

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Garmin AT**  
 Specification: **2.1053/87.139**  
 Work Order #: **81985**  
 Test Type: **Conducted RF Power**  
 Equipment: **Universal Access Transceiver**  
 Manufacturer: **Garmin AT**  
 Model: **GDL 90**  
 S/N: **6068135**

Date: 05/18/2004  
 Time: 11:38:22  
 Sequence#: 7  
 Tested By: Randal Clark

### ***Test Equipment:***

| Function               | S/N        | Calibration Date | Cal Due Date | Asset # |
|------------------------|------------|------------------|--------------|---------|
| HP 8566B SA            | 2209A01404 | 02/26/2003       | 02/26/2005   | 00490   |
| HP 8566B SA Display    | 2403A08241 | 02/26/2003       | 02/26/2005   | 00489   |
| HP 85650A QPA          | 2811A01267 | 02/26/2003       | 02/26/2005   | 00478   |
| EMCO Loop Antenna      | 1074       | 05/21/2003       | 05/21/2005   | 00226   |
| EMCO 3115 Horn Antenna | 9006-3413  | 04/15/2003       | 04/25/2005   | 327     |
| Chase CBL6111C Bilog   | 2456       | 12/13/2002       | 12/13/2004   | 01991   |

### ***Equipment Under Test (\* = EUT):***

| Function                      | Manufacturer | Model # | S/N     |
|-------------------------------|--------------|---------|---------|
| Universal Access Transceiver* | Garmin AT    | GDL 90  | 6068135 |

### ***Support Devices:***

| Function                | Manufacturer              | Model #   | S/N      |
|-------------------------|---------------------------|-----------|----------|
| DC Power Supply         | Astron                    | LS-10A    | 99050014 |
| I/O Test Interface Unit | UPS Aviation Technologies | RL#E-81-4 | J        |

### ***Test Conditions / Notes:***

EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, both ports are terminated in characteristic impedance. Frequency Range Investigated 9 kHz to 10 GHz. **No spurious emissions detected within 20dB of the limit within the frequency range of 9kHz to 1GHz.** Measurement Detector Functions: 9kHz to 150kHz RBW=VBW=300Hz 150kHz to 30MHz RBW=VBW=10kHz 30-10000 MHz RBW=VBW=100kHz.

### ***Transducer Legend:***

|                     |                                      |
|---------------------|--------------------------------------|
| T1=Amp - S/N 604    | T2=Amp - S/N 301                     |
| T3=Bilog Site B     | T4=Horn AN 00656 1-18 GHz (Mariposa) |
| T5=Cable - 10 Meter | T6=Cable - 3 Meter to bulkhead       |
| T7=Cable HF-005-20  |                                      |

### ***Measurement Data:***

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng | T1   | T2    | T3   | T4    | Dist  | Corr   | Spec   | Margin | Polar |
|---|-----------|------|------|-------|------|-------|-------|--------|--------|--------|-------|
|   | MHz       | dBμV | T5   | T6    | T7   |       | Table | dBμV/m | dBμV/m | dB     | Ant   |
|   |           |      | dB   | dB    | dB   | dB    |       |        |        |        |       |
| 1 | 1956.840M | 79.7 | +0.0 | -35.2 | +0.0 | +26.8 | +0.0  | 77.5   | 82.3   | -4.8   | Horiz |
|   |           |      | +0.0 | +4.4  | +1.8 |       |       |        |        |        | 111   |

|    |           |      |       |       |       |       |      |      |      |       |       |
|----|-----------|------|-------|-------|-------|-------|------|------|------|-------|-------|
| 2  | 4888.240M | 67.5 | +0.0  | -34.7 | +0.0  | +33.3 | +0.0 | 76.6 | 82.3 | -5.7  | Horiz |
|    |           |      | +0.0  | +7.3  | +3.2  |       |      |      |      |       | 105   |
| 3  | 5869.480M | 62.7 | +0.0  | -34.8 | +0.0  | +34.4 | +0.0 | 73.9 | 82.3 | -8.4  | Horiz |
|    |           |      | +0.0  | +8.1  | +3.5  |       |      |      |      |       | 103   |
| 4  | 2934.440M | 67.3 | +0.0  | -35.0 | +0.0  | +30.1 | +0.0 | 70.0 | 82.3 | -12.3 | Horiz |
|    |           |      | +0.0  | +5.4  | +2.2  |       |      |      |      |       | 108   |
| 5  | 4891.920M | 60.5 | +0.0  | -34.7 | +0.0  | +33.3 | +0.0 | 69.6 | 82.3 | -12.7 | Vert  |
|    |           |      | +0.0  | +7.3  | +3.2  |       |      |      |      |       | 105   |
| 6  | 3913.360M | 61.7 | +0.0  | -34.6 | +0.0  | +32.9 | +0.0 | 69.2 | 82.3 | -13.1 | Horiz |
|    |           |      | +0.0  | +6.6  | +2.6  |       |      |      |      |       | 105   |
| 7  | 5865.920M | 54.5 | +0.0  | -34.8 | +0.0  | +34.4 | +0.0 | 65.7 | 82.3 | -16.6 | Vert  |
|    |           |      | +0.0  | +8.1  | +3.5  |       |      |      |      |       | 105   |
| 8  | 1955.120M | 63.9 | +0.0  | -35.2 | +0.0  | +26.8 | +0.0 | 61.7 | 82.3 | -20.6 | Vert  |
|    |           |      | +0.0  | +4.4  | +1.8  |       |      |      |      |       | 111   |
| 9  | 3632.005M | 52.9 | +0.0  | -35.0 | +0.0  | +33.3 | +0.0 | 59.9 | 82.3 | -22.4 | Horiz |
|    |           |      | +0.0  | +6.2  | +2.5  |       | 33   |      |      |       | 120   |
| 10 | 3911.040M | 51.9 | +0.0  | -34.6 | +0.0  | +32.9 | +0.0 | 59.4 | 82.3 | -22.9 | Horiz |
|    |           |      | +0.0  | +6.6  | +2.6  |       |      |      |      |       | 108   |
| 11 | 2934.800M | 56.0 | +0.0  | -35.0 | +0.0  | +30.1 | +0.0 | 58.7 | 82.3 | -23.6 | Horiz |
|    |           |      | +0.0  | +5.4  | +2.2  |       |      |      |      |       | 108   |
| 12 | 908.089M  | 54.9 | -27.3 | +0.0  | +22.9 | +0.0  | +0.0 | 58.6 | 82.3 | -23.7 | Horiz |
|    |           |      | +8.1  | +0.0  | +0.0  |       | 116  |      |      |       | 109   |
| 13 | 4540.160M | 50.5 | +0.0  | -34.5 | +0.0  | +32.6 | +0.0 | 58.5 | 82.3 | -23.8 | Horiz |
|    |           |      | +0.0  | +7.1  | +2.8  |       | 292  |      |      |       | 125   |
| 14 | 3631.880M | 51.0 | +0.0  | -35.0 | +0.0  | +33.3 | +0.0 | 58.0 | 82.3 | -24.3 | Vert  |
|    |           |      | +0.0  | +6.2  | +2.5  |       | 137  |      |      |       | 139   |
| 15 | 908.085M  | 54.0 | -27.3 | +0.0  | +22.9 | +0.0  | +0.0 | 57.7 | 82.3 | -24.6 | Vert  |
|    |           |      | +8.1  | +0.0  | +0.0  |       | 196  |      |      |       | 118   |
| 16 | 2724.010M | 55.6 | +0.0  | -35.0 | +0.0  | +29.3 | +0.0 | 57.2 | 82.3 | -25.1 | Horiz |
|    |           |      | +0.0  | +5.2  | +2.1  |       | 273  |      |      |       | 142   |
| 17 | 2724.120M | 53.9 | +0.0  | -35.0 | +0.0  | +29.3 | +0.0 | 55.5 | 82.3 | -26.8 | Vert  |
|    |           |      | +0.0  | +5.2  | +2.1  |       | 344  |      |      |       | 117   |
| 18 | 4539.900M | 47.0 | +0.0  | -34.5 | +0.0  | +32.6 | +0.0 | 55.0 | 82.3 | -27.3 | Vert  |
|    |           |      | +0.0  | +7.1  | +2.8  |       | 5    |      |      |       | 125   |
| 19 | 1816.055M | 55.1 | +0.0  | -35.3 | +0.0  | +26.3 | +0.0 | 52.0 | 82.3 | -30.3 | Horiz |
|    |           |      | +0.0  | +4.2  | +1.7  |       | 363  |      |      |       | 147   |
| 20 | 1816.070M | 47.2 | +0.0  | -35.3 | +0.0  | +26.3 | +0.0 | 44.1 | 82.3 | -38.2 | Vert  |
|    |           |      | +0.0  | +4.2  | +1.7  |       |      |      |      |       | 113   |

## PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

**PHOTOGRAPH SHOWING RADIATED EMISSIONS**



Radiated Emissions - Back View

## FCC 2.1033(c)(14)/2.1055/87.133- FREQUENCY STABILITY

**Test Conditions:** EUT is a transmitter designed for aircraft use. EUT power is provided via support DC power supply. RF output is provided on two ports, only one port is tested. Test data represents the worst case emissions. Due to EUT transmit duty cycle, RF output port conducted emissions are performed using max hold function. The variable DC power supply was used to during Voltage Variations testing. EUT was connected directly to the analyzer through external attenuators. Due to the signal characteristics the frequency stability measurements on the carrier were impractical, therefore frequency stability measurements are performed on pilot tone.

**Customer:** Garmin AT  
**WO#:** 81985  
**Date:** 25-May-04  
**Test Engineer:** Randal Clark and Mike Wilkinson

**Device Model #:** GDL 90  
**Operating Voltage:** 28 VDC  
**Frequency Limit:** 20 PPM  
**Frequency Ref:** 908 MHz

### Temperature Variations

| Temp (C) | Voltage | Deviation (PPM) |
|----------|---------|-----------------|
| -30      | 28      | 3.76652         |
| -20      | 28      | 3.72247         |
| -10      | 28      | 3.30396         |
| 0        | 28      | 4.77974         |
| 10       | 28      | 6.55286         |
| 20       | 28      | 5.99119         |
| 30       | 28      | 1.56388         |
| 40       | 28      | 13.57930        |
| 50       | 28      | 16.26652        |

### Voltage Variations ( $\pm 15\%$ )

|    |      |         |
|----|------|---------|
| 20 | 23.8 | 6.12335 |
| 20 | 28   | 5.99119 |
| 20 | 32.2 | 5.89207 |

|                      |                  |
|----------------------|------------------|
| <b>Max Deviation</b> | 16.26652<br>PASS |
|----------------------|------------------|

**Test Equipment**

| <i>Description</i>                | <i>Asset #</i> | <i>Manufacturer</i> | <i>Model #</i> | <i>Serial #</i> | <i>Cal Date</i> | <i>Cal Due</i> |
|-----------------------------------|----------------|---------------------|----------------|-----------------|-----------------|----------------|
| Digital Multimeter                | 01241          | Radio Shack         | 22-183         | NA              | NR              | NR             |
| Spectrum Analyzer 100Hz - 22.5GHz | 00490          | HP                  | 8566B          | 2209A01404      | 2/26/03         | 2/26/05        |
| Spectrum Analyzer Display         | 00489          | HP                  | 8566B          | 2403A08241      | 2/26/03         | 2/26/05        |
| Spectrum Analyzer QP Adapter      | 00478          | HP                  | 85650A         | 2811A01267      | 2/26/03         | 2/26/05        |
| Temp Chamber                      | 01879          | Thermotron          | S-1.2 MiniMax  | 11899           | 1/31/03         | 1/31/05        |
| Variable DC Power Supply          | 00765          | Sorensen            | DCR-60-30B     | 176             | 7/8/03          | 7/7/05         |
| Temperature Meter                 | 02242          | Omega               | HH-26K         | T-202884        | 8/15/03         | 8/15/05        |

NR = Not Required

**PHOTOGRAPH SHOWING TEMPERATURE TESTING**

